METHOD AND SYSTEM FOR NAVIGATING WITHIN A BODY OF DATA USING ONE OF A NUMBER OF ALTERNATIVE BROWSE GRAPHS

TECHNICAL FIELD

The present invention is directed to the field of data browsing, and, more particularly, to the field of customizable data browsing.

BACKGROUND

As computer use, and particularly the use of the World Wide Web, becomes more and more prevalent, the volumes of data that are available for access using a computer system grow larger and larger. In order for a user to be able to find and make use of particular data, the body of data in which the particular data is contained must be effectively organized.

One way in which a body of data can be organized is by providing a browse graph onto the body of data. A browse graph is a structure, or a "map," for navigating the information contained in the body of data. A browse graph is made up of nodes between which the user may move to access different portions of the information in the body of data. The user begins at a first node, called a "root node." At the root node, the user may choose from a number of different categories. By selecting one of these categories, the user moves to a different node, where the user may view a portion of the information in the body of data pertaining to the selected category and/or select from among a new set of categories to move to another node in the graph. In this manner, the user may move from node to node, viewing the information corresponding to each node.

As an example, an online merchant may provide a browse graph onto information on a large number of items that it is offering for sale. In order to find information on Pez candy dispensers for sale using such a browse graph, a user begins at the root node of the browse graph, and there chooses "COLLECTIBLES" from among a list of high-level categories including "ARTS & ANTIQUES," "BOOKS," "CLOTHING & ACCESSORIES," "COINS & STAMPS," and "COLLECTIBLES,"

among others. By choosing the "COLLECTIBLES" category, the user moves to a lower-level node in the graph. There, the user chooses "PEZ" from among a list of lower-level categories that are all subcategories of "COLLECTIBLES," including "AUTOGRAPHS," "BOTTLES & CANS," "LUNCHBOXES," and "PEZ," among others. By choosing the "PEZ" category, the user moves to a yet-lower-level node in the graph, where the user can view information on Pez candy dispensers offered for sale by the online merchant.

Such browse graphs, while generally useful, can be disadvantageous when they are poorly adapted to a particular user. For example, where a browse graph locates information that a user is particularly interested in at a level "deep" in the browse graph, thereby requiring a large number of selections to reach the information, that browse graph becomes cumbersome for that user to use. On the other hand, where a browse graph provides access to information that a user does not wish to see or is prohibited from seeing, that browse graph is over-inclusive with respect to that user.

Accordingly, a facility for providing browse graphs that are customized to their users would have significant utility.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a high-level block diagram showing the environment in which the facility preferably operates.

Figures 2A-2C are display diagrams showing a user browsing to a "PEZ" category using a first browse graph.

Figures 3A-3B are display diagrams showing that a user is unable to browse to the "PEZ" category using a second browse graph.

Figures 4A-4E are display diagrams showing a user browsing to a "PHONES" category using the first browse graph.

Figures 5A-5B are display diagrams showing a user using the second browse graph browse to a "HANDIES" category having the same contents as the "PHONES" graph in the first browse graph.

Figure 6 is a flow diagram showing the steps preferably performed by the facility in order to select and use a particular browse graph for browsing.

Figure 7 is a flow diagram showing the steps preferably performed by the facility in order to generate an alternative browse graph.

Figure 8 is a data structure diagram showing a sample browse graph.

Figure 9 is a data structure diagram showing a sample alternative browse graph derived from the browse graph shown in Figure 8.

Figure 10 is a data structure diagram showing a sample relation table representing a single browse graph.

Figure 11 is a data structure diagram showing a sample relation table representing two alternative browse graphs, including the browse graph represented by the relation table shown in Figure 10 and an alternative browse graph derived from the browse graph represented by the relation table shown in Figure 10.

DETAILED DESCRIPTION

The present invention is directed to data navigation using one of a number of alternative browsing graphs. In a preferred embodiment, a browsing facility ("the facility") maintains two or more different browsing graphs on the same set of browse data. Based upon information associated with a user seeking to browse the browse data, or based upon the nature of a request issued by the user, the facility selects one of the browsing graphs, which is used by the user to browse the browse data. By providing different browse graphs on the same browse data, the facility enables a user to utilize a browse graph that is tailored to the user. For example, for a user that has a special interest in a particular kind of data, the user may utilize a browse graph that features that data more prominently, allowing the user to reach the data much more efficiently. As another example, for users that are prohibited from seeing or wish not to see particular data, a browse graph may be provided that does not provide access to such information. By providing multiple browse graphs onto the same browse data in this manner, the facility is able to make the browse data more usable to users with different browsing preferences.

Figure 1 is a high-level block diagram showing the environment in which the facility preferably operates. The block diagram shows client computer systems, such as client computer systems 110 and 120, that are connected via the Internet 130 to a

server computer system 140. Those skilled in the art will recognize that client computer systems could be connected to the server computer system by networks other than the Internet, however. The client computer systems preferably have a web client computer program, such as web clients 121 and 131, that are used by users to connect to a web server computer program 141 in the server computer system.

The web server, together with the facility 142, enables the user of a web client to browse a body of browse data, such as browse data 151 and browse data 161. Such browsing uses one of a plurality of browse graphs, also called "browse hierarchies" provided for the browse data. For example, for browse data 161, three browse graphs 165, 166 and 167 are provided. A body of browse data together with the browse graphs provided for are together known as a "browse group." For example, browse data 161 and browse graphs 165, 166, and 167 together comprise browse group 160. The facility 142 executing on the server computer system preferably identifies one of the browse graphs provided for a body of browse data as described further below. In an alternate embodiment, each of the browse graphs in a particular browse group is distributed to a different server computer system, such that the browse graph used by the user is determined by the identity of the server computer system to which the user connects. In this embodiment, the browse data may either be maintained in a central server computer system, or replicated to some or all of the multiple server computer systems.

While preferred embodiments are described in terms of the environment described above, those skilled in the art will appreciate that the facility may be implemented in a variety of other environments, including a single, monolithic computer system, as well as various other combinations of computer systems or similar devices.

To more fully illustrate its implementation and operation, the facility is described in conjunction with an example in which the body of data is comprised of information describing a large number of items that are for sale, such as items available for sale via online auction. Those skilled in the art will recognize, however, that the facility may be employed to navigate bodies of data of all sorts. In the example, the user wishes to display information about Pez candy dispenser items and mobile phone items that are for sale.

Figures 2A-2C are display diagrams showing a user browsing to a "PEZ" category containing such information using a first browse graph in which such information is accessible. Figure 2A shows the display of a web page ("page") 201 containing the initial categories occurring at the root node of the first browse graph. In particular, the categories 210 include "COLLECTIBLES" category 111.

When the user selects "COLLECTIBLES" category 111, the facility displays page 202 shown in Figure 2B. Page 202 contains a new set of categories 220, each relating to a different type of collectible items. The categories 220 include a "PEZ" category 221 for Pez candy dispensers.

When the user selects category 221 for Pez candy dispensers, the facility displays page 203 shown in Figure 2C. Page 203 contains information 230 about Pez candy dispensers that are for sale. For example, information item 231 shows information about a Pez candy dispenser in the shape of the Marvin the Martian character that is being sold via online auction. Thus, it can be seen that, using the first browse graph, a user is able to access information about Pez candy dispensers.

In this respect, the first browse graph is contrasted with a second browse graph, which prevents access to information about Pez candy dispensers that are for sale. Such prevention may be desirable where the user is uninterested in or offended by such candy dispensers, or where the user resides in a jurisdiction where the sale or purchase of such candy dispensers is illegal.

Figures 3A-3B are display diagrams showing that a user is unable to browse to the "PEZ" category using a second browse graph. Figure 3A shows the display of page 301, in which is displayed a list 310 of the categories available from the root node of the second browse graph. The displayed categories 310 includes a "COLLECTIBLES" category 311.

When the user selects the "COLLECTIBLES" category 311, page 302 shown in Figure 3B is displayed. Page 302 contains a list 320 available at the collectibles node of the second browse graph. Categories 320 shown in Figure 3B differ from categories 210 in that they omit the "PEZ" category included in the first browse graph. Because this category is not available at the collectibles node of the second browse graph, users using the second browse graph to browse the body of information about items

offered for sale are prevented from accessing information about Pez candy dispensers that are for sale.

A second aspect of the example shows how a browse graph may be adapted to locate information about a topic of interest to its users in close proximity to the root node, thereby shortening the path of interactions that users must perform in order to browse to such information. In the example, a path requiring four interactions in the first browse graph is reduced to a path requiring only one interaction in the second browse graph.

Figures 4A-4E are display diagrams showing a user browsing to a "PHONES" category using the first browse graph. Figure 4A shows the display of page 401, which contains the categories 410 at the root node of the first browse graph. The categories 410 include an "ELECTRONICS & PHOTOGRAPHY" category 411.

When the user selects the "ELECTRONICS & PHOTOGRAPHY" in category 411, the facility displays page 402 shown in Figure 4B. Page 402 includes categories 420 each corresponding to a subcategory of "ELECTRONICS & PHOTOGRAPHY." The categories 420 include a "CONSUMER ELECTRONICS," category 421.

When the user selects the "CONSUMER ELECTRONICS" category 421, the facility displays page 403 shown in Figure 4C. Page 403 includes categories 430 each corresponding to a subcategory of "CONSUMER ELECTRONICS." Categories 430 include a "MOBILE PHONES" category 431.

When the user selects the "MOBILE PHONES" category 431, the facility displays page 404 shown in Figure 4D. Page 404 contains categories 440 relating to mobile phones a "PHONES" category 441. When the user selects the "PHONES" category 441, the facility displays page 405 shown in Figure 4E. Page 405 contains information 450 about cellular phone items that are for sale. For example, information item 451 contains information about an Audivox cellular phone that is for sale via auction.

It can be seen that traversing the first browse graph to access information about cellular phones is relatively arduous, requiring four different user interactions to reach the information from the root node. The second browse graph, on the other hand,

developed for users having an interest in mobile phones, enables a user to browse to the same information in a single interaction.

Figures 5A-5B are display diagrams showing a user using the second browse graph to browse to a "HANDIES" category having the same contents as the "PHONES" category in the first browse graph. Figure 5 shows the display of page 501 at the root of the second browse graph. Page 501 includes a list of categories 510 which, in addition to the "ELECTRONICS & PHOTOGRAPHY" category 512, includes a "HANDIES" category 511.

When the user selects the "HANDIES" category 511, the facility immediately displays page 502 shown in Figure 5B. Page 502 contains information 520 about mobile phones, or "handies" that are for sale. It can be seen that, when using the second browse graph, this information may be accessed with only a single user interaction by selecting the handies category at the root of the second browse graph.

The facility provides for browse graphs to be created and associated with users in a variety of ways. A browse graph may be associated with a single user, or with a class, or "group" of users. That is, each browse graph may be associated with a particular user's identity, or rather may be associated with groups of users having particular Internet Service Providers, domain name designations, geographic or political regions, or buying patterns. Alternatively, browse graphs, rather than having associations with groups of users, may be dynamically selected by users, either explicitly or implicitly. For explicit selection, the facility preferably displays a list or other indication of the available browse graphs. The user then clicks on or otherwise identifies the browse graph that the user wishes to use to browse the associated body of data. For implicit selection, the selection of a browse graph is performed by the way in which the user selects the body of data to be browsed. For example, if a company operated a first online auction website for the United States and a second online auction website for the United Kingdom, the company could establish a first browse graph on the auction data for the United States online auction website and a second browse graph on the auction data for the United Kingdom on-line auction website. The user would implicitly select between the first and second browse graphs by selecting between the United States and the United Kingdom websites. Still further, a browse graph may be dynamically

generated in response to a browse request, based upon such factors as are described above.

Figure 6 is a flow diagram showing the steps preferably performed by the facility in order to select and use a particular browse graph for browsing. In step 601, the facility selects one of the plurality of browse graphs available for the body of data. Such a selection is preferably performed in one or more of the manners discussed above, or may be performed using additional bases. In step 602, the facility sets the current node of the traversal to the root node of the selected browse graph. The facility then loops through steps 603-607 while the current node is the parent of at least one relation between nodes. In step 604, the facility displays a hyperlink for each relation of which the current node is the parent, such as the hyperlinks of the categories 210 shown in Figure 2A. In step 605, the facility receives user input selecting one of the hyperlinks displayed in step 604. In step 606, the facility changes the current node in the traversal to the node that is the child of the relation whose hyperlink is selected. In step 607, if the new current node is the parent of at least one relation in the browse graph, then the facility continues in step 604, else the facility continues in step 608. In step 608, the traversal has reached a leaf node of the browse graph that has no children and with which specific browse data is associated, and the facility displays the browse data stored for the current node. After step 608, these steps conclude.

Figure 7 is a flow diagram showing the steps preferably performed by the facility in order to generate an alternative browse graph. In step 701, the facility creates a copy of an existing browse graph. In step 702, the facility translates the names of the relations occurring in the copy of the browse graph if the new browse graph is to be in a different natural language. In step 703, the facility modifies the copy of the browse graph to customize the copy of the browse graph for its intended audience. Step 703 variously involves adding and/or deleting relations in the copy of the browse graph. After step 703, these steps conclude and the new browse graph can be made available for use by users.

Figure 8 is a data structure diagram showing a sample browse graph. The browse graph is comprised of nodes, shown as circles, connected by directional relations, shown as arrows. Each relation is said to have a parent node, shown at the tail end of its arrow, and a child node, shown at the head end of its arrow. Five relations are shown in

Figure 8 that have the root node, node 1, as their parent node: "COINS & STAMPS" relation 5, "COLLECTIBLES" relation 6, "COMICS, CARDS, & SCI-FI" relation 7, "COMPUTERS & SOFTWARE" relation 8, and "ELECTRONICS & PHOTOGRAPHY" relation 9. Each of these relations corresponds to a category shown when positioned at the root node of the first browse graph. When the user is positioned at root node 1 and selects one of the categories corresponding to one of these relations, the facility traverses the browse graph along that relation from the relation's parent node to its child node. For example, if the category for "COLLECTIBLES" relation 6 is selected by the user while at the root node, the facility traverses the collectible relation 6 to its child node, node 36. At that point, the facility displays the page containing categories corresponding to the relations that have the current node, node 36, as their parent node: "COINS & STAMPS" relation 23, "PAPER" relation 94, "PEZ" relation 95 and "PINBACKS" relation 96. When the user selects one of the categories corresponding to these relations, the facility traverses that relation. For example, if the user selects the category corresponding to the "PEZ" relation 95, then the facility traverses the "PEZ" relation 95 to node 76. Node 76 is characterized as a "leaf node," as there are no relations having node 76 as their parent node. For ease of reference, leaf nodes are identified by a double circle. When the facility traverses to node 76, it identifies node 76 as a leaf node, and displays the browse information associated with it—in this case, the Pez candy dispenser items for sale information shown in Figure 2C.

In general, the number of relations that must be traversed from the root node in order to reach a particular node is referred to as the depth of that node in the graph. It should be noted that, in some browse graphs, it is possible to reach a particular node by two or more different paths of relations. For example, leaf node 92 may be reached either through the path containing "COINS & STAMPS" relation 5 and "COLLECTIBLES" relation 14, or by the path containing "COLLECTIBLES" relation 6 and "COINS & STAMPS" relation 23. Such "alternative paths" to the same node from the root node may contain different numbers of relations. It should further be noted that, for clarity, some nodes and relations—identified by ellipses—have been omitted from the browse graph shown in Figure 8.

Figure 9 is a data structure diagram showing a sample alternative browse graph derived from the browse graph shown in Figure 8. The browse graph shown in Figure 9 has been derived from the browse graph shown in Figure 8 using the steps shown in Figure 7. In comparing Figure 9 to Figure 8, it can be seen that the two browse graphs shown therein are mostly comprised of the same nodes and relations. It can be seen, however, that "PEZ" relation 95 occurring in the first browse graph shown in Figure 8 is omitted from the second browse graph shown in Figure 9, thereby preventing access to the browse data associated with node 76 by those users using the second browse graph. The second browse graph further differs from the first browse graph in that it contains "HANDIES" relation 693 from the root node to leaf node 44. This relation has been added to make the browse information associated with the node 44 more readily available to users of the second browse graph.

While the first and second browse graphs are shown conceptually in Figures 8 and 9, browse graphs are preferably stored in table form. Figure 10 is a data structure diagram showing a sample relation table representing only the first browse graph. The relation table 1000 is comprised of rows 1011-1023, each corresponding to one relation in the first browse graph. Each row contains five fields: a graph identifier field 1001, a relation identifier field 1002, relation name field 1003, parent node identifier 1004, and a child node identifier 1005. Because relation table 1000 contains only relations in the first browse graph, the graph identifier field in every row contains the same graph identifier. The relations identifier field contains a unique identifier for each relation in the graph. For example, the relation identifier field of row 1019 contains the relation identifier "95" for the "PEZ" relation shown in Figure 8. Relation name field contains the name of the relation for each row, which preferably corresponds to the text displayed by the facility to the user for selecting a further category. The parent node identifier field contains the unique identifier of the node that is the parent node for the relation described by the row. For example, row 1019 indicates that the parent node of the "PEZ" relation 95 has a node identifier "36." Similarly, the child node identifier field indicates the node identifier for the node that is the child node of the relation that the row describes. For example, row 1019 indicates that the child node of the Pez relation 95 has node identifier "76."

In order to identify for a particular current node the categories that are available for selection, the facility preferably searches the relation table for relations having the node identifier of the current node in their parent node identifier fields. If the result set of such rows is nonempty, then the facility preferably displays the relation names of those relations as categories for the user to choose. If, on the other hand, the result set is empty, then the current node is a leaf node, and the facility preferably displays the browse data associated with the leaf node.

Figure 11 is a data structure diagram showing a sample relation table representing both the first and the second browse graphs. In accordance with the steps shown in Figure 7, the facility has copied the contents of rows 1011-1023 and to relation table 1100 as new rows 1124-1136. The facility then changes the graph identifier field for the new rows to contain the new graph identifier 2 identifying the new browse graph. The facility further deleted the copy of row 1019 for the "PEZ" relation 95 among the new rows, and added row 1136 for the new "HANDIES" relation 693.

It will be understood by those skilled in the art that the above-described facility could be adapted or extended in various ways. For example, browse graphs may be provided on bodies of data of virtually any type. While the foregoing description makes reference to preferred embodiments, the scope of the invention is defined solely by the claims that follow and the elements recited therein.